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ABSTRACT

Drunk driving is a major public health problem and young people suffer disproportionately high rates of morbidity and mortality as a result of drinking and driving. Motor vehicle injuries are the leading cause of death for persons aged 15-24 in this country, and alcohol is implicated in many of these deaths. Countermeasures to drinking and driving may be viewed in terms of both individual and societal responsibilities. Individual measures include efforts aimed at increasing apprehension, certainty and severity of sanctions, and education and rehabilitation. Societal countermeasures include reduced alcohol availability, modification of tax policies affecting the price of alcohol, increased regulation of alcohol advertising, modification of media program content in relation to alcohol, improved highway design, and increased vehicle crashworthiness. Several special factors affect drinking and driving in young people. They are less experienced drivers, they have the money to spend on alcohol, and they are influenced by both peer pressure and role models who drink. Until we recognize and deal with some of the sources of the drinking and driving problems of youth, drunk driving will continue to be a major cause of morbidity and mortality in young people. (NRB)

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THE YOUNG DRINKING DRIVER:

CAUSE OR EFFECT?

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Prepared for the Research Workshop on Alcohol and the Drinking Driver, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, Maryland, May 2-4, 1984.

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THE YOUNG DRINKING DRIVER: CAUSE OR EFFECT?

INTRODUCTION

This paper attempts to bring together a variety of lines of research to focus on the issue of the young drinking driver--what are some of the causal factors in the creation of young drinking drivers; where does, and where should, the responsibility for this problem lie; and, perhaps most importantly, what are the most effective points of intervention? The paper reviews briefly the dimensions of the problem, determinants of countermeasure selection, possible countermeasures and their effectiveness, special factors affecting drinking and driving in young people, and finally drunk driving as a major public health problem.

The thesis of this paper is that drunk driving is a major public health problem, and that young people suffer disproportionately high rates of morbidity and mortality as a result of drinking and driving. Viewed in the traditional public health perspective, drinking and driving among young people should best respond to preventive measures focused on the larger society rather than to measures that deal principally with the individual who has been identified as an offender. In considering preventive measures, it is also necessary to recognize the entire range and extent of influences in our society that are relevant to the young person's decision whether to drink and drive.

DIMENSIONS OF THE PROBLEM

Morbidity and Mortality Rates

In the U.S. today, motor vehicle injuries are by far the leading

cause of death for persons ages 15 through 24. In Healthy People the Surgeon General reported that in the previous 20 years every age group had shown an increase in life expectancy with the exception of those age 15-24. This group had actually shown a decrease in life expectancy, with death rates increasing steadily since 1960. The major cause is motor vehicle injuries (U.S. Department of Health, Education, and Welfare, 1979).

To what extent is alcohol implicated in these motor vehicle deaths? Based on national data, Fell (1982) reports that 42.6 percent of fatally injured driver ages 16 through 19 have measured blood alcohol concentrations (bac's) of 0.10 percent or higher, while for drivers ages 20 through 24 the proportion is 54.1 percent. These two age groups account for 36.6 percent of fatally injured drivers, although they account for less than 30 percent of the licensed population. Table 1 shows the extent of alcohol involvement (defined as any measured alcohol of 0.01 percent or higher) found in these young drivers.

(Table 1 about here)

For both fatal and injury crashes, the rates of alcohol involvement are much higher for nighttime crashes than for those occurring in the daytime.

Age and Sex Differences

Motor vehicle fatality rates are much higher for young males than females, although they are the leading cause of death for both sexes in this age group. The most recent figures from the National Safety

Table 1. Percent of Young Driver Crashes Involving Alcohol (bac 0.01)

	Injury Severity	
	Fatal	Injury
Age		
16-17	36.6	8.4
18	43.9	9.8
19	47.5	13.6
20	47.2	13.7
21	49.6	12.2
22-24	50.4	15.3

Council (1983) report that males age 15 through 24 experience a death rate of 69.8 per 100,000 population, compared to 21 for females.

Motor vehicle injuries are likewise predominantly a male phenomenon. Spinal cord injury (SCI) generally is much more frequent among males, who account for three-fourths or more of all such injuries. Motor vehicle crashes account for approximately half of all spinal cord injuries. In one major study (Smart and Sanders, 1976) it was found that of SCI resulting from motor vehicle crashes, 67 percent of the paraplegics and 81 percent of the quadriplegics were male. The highest population rates for motor vehicle-related SCI are for ages 16 through 25 for both males and females, although the rates are much higher for males. Likewise, these age groups account for by far the largest proportion (about 40 percent) of total SCI caused by motor vehicle injuries.

Societal Costs

Although precise estimates of total costs attributable to drunk driving have not been calculated specifically for this age group, Hartunian et al. (1981) report that 73 percent of all motor vehicle fatalities are male and that 37 percent of these fatalities are ages 15 through 24. Twenty-nine percent of the female fatalities fall into this age range. Because motor vehicle injuries strike young people so disproportionately, the corresponding societal costs of injury and death are greater.

The National Highway Traffic Safety Administration (NHTSA) has estimated the total economic costs to society of motor vehicle accidents in 1980 at $57.2 billion (NHTSA, 1980). A significant portion of that cost, namely, $21.7 billion, is for property damage

crashes. While alcohol involvement is estimated to be relatively low in such crashes (8 %), the fact that there are so many of them means that even a small percentage translates into large costs. An additional $15.3 billion is for injury crashes, while the costs for fatal crashes total $13.7 billion.

Fell (1982) has estimated that alcohol levels of 0.10 percent or higher (the level for legal intoxication in most states) are involved in approximately 5 percent of property damage crashes, 18 percent of injury crashes, and 47 to 50 percent of fatal crashes. Applying these estimates to the societal cost estimates by type of crash results in the following equation:

(.05) ($21.7 billion) + (.18) ($15.3 billion) + (.485) ($13.7 billion) = $10.4835 billion.

This figure represents a rough estimate of the costs of alcohol-related motor vehicle crashes in 1980. What proportion of this may be attributed to the young driver is not known, but if it is roughly the same proportion as that of total costs of injuries (not counting property damage costs) accounted for by the ages 15 through 24 group, namely 32 percent (Hartunian, et al., 1981), then we may conclude that drinking and driving in this age group resulted in almost three and a half billion dollars in societal costs in 1980. These calculations are based on the best information available, but they must be considered tentative and therefore interpreted with caution. Furthermore, they are based on estimates of crashes in which the blood alcohol level is 0.10 percent or higher. It is well established that young driver get into trouble at lower levels (Jones and Joscelyn, 1978), and to that extent these estimates are

conservative.

DETERMINANTS OF COUNTERMEASURE SELECTION

How we define a problem to a large extent determines where and how we attempt to intervene. If the problem of drunk driving among young people is viewed primarily as one of personal responsibility and choice, we are dealing with immoral behavior that has been defined in our society as criminal. As such, we are operating in the realm of blame, guilt, prosecution, and punishment, representing a time-honored approach to health problems in our society. This approach focuses on what is different about the individual who evidences the health problem, what can be done to identify high risk individuals, and what can be done to modify them in such a way as to lower their risk.

On the other hand, if the problem of drunk driving is defined as the product of a system of complex interactions of causal factors, we can take a comprehensive look at the entire system and examine where it may be feasible and most effective to intervene to modify the rates of injury and death. This approach typifies the public health philosophy, although in the area of injury control even public health professionals have been slow to recognize the applicability of more general preventive measures (Barry, 1975). This systems approach assumes that at least some of the problem is societal and that some of the solution lies in societal action.

POSSIBLE COUNTERMEASURES AND THEIR EFFECTIVENESS

The possibilities for countermeasures are many. The recent final report of the Presidential Commission on Drunk Driving included a total of 88 recommendations covering ten different areas (1983). Some of the major countermeasures possible within each of the two major

frameworks (individual versus societal) will be discussed, along with whatever evidence is available on their effectiveness. In the examples chosen, we are mindful that the two approaches are not independent but rather represent alternative foci.

Countermeasures Based on Individual Responsibility View

Traditionally we have responded, and continue to respond, to many health problems in this fashion. In a bicentennial essay in TIME, the former Secretary of the U.S. Department of Health, Education, and Welfare John Knowles (1976) describes how in colonial times some illnesses were seen as the work of the devil, and treatment may have included measures that would be considered harsh by today's standards. Even in the 1930s and 40s, in many circles tuberculosis and cancer were not discussed openly, for there was a stigma attached to having them. A current example of how blame and stigma are imputed to the individual who is ill is the public's reaction to AIDS.

Regardless of the morality or immorality of a health problem, from the societal standpoint we need to ask how effective are treatments that derive from the view that the problem lies within the individual. If the treatment works, then there may be less concern as to how appropriate it may be from the standpoint of individual moral responsibility.

The countermeasures for youthful drunk driving that are based primarily on the moral approach, and hence focus on the individual, include efforts aimed at increasing apprehension (enforcement), certainty of sanctions, and severity of sanctions. Preconviction educational efforts attempt to persuade the individual to choose not to drive and drink, and thus may be considered preventive in intent.

Postconviction education focuses on the individual in an attempt to discourage recidivism. Emergency medical services may also be considered an individual-focused approach.

Increased Probability of Apprehension. It is widely held that one of the major requirements for reducing drunk driving is a significant increase in the probability that a driver will be detected and apprehended if he or she is drunk. This approach has received strong support from the federal government, and special training programs have been developed and implemented to assist officers in the detection of drunk driving offenses (Harris et al., 1980). In addition, efforts are being made to have citizens report to enforcement observed instances of drunk driving. When emphasis is placed on arresting drunk drivers, there is an increase in the number of such arrests.

An evaluation of the effectiveness of increasing probability of apprehension must begin with the recognition that probability of detection is very low. Available evidence indicates that the chances of being apprehended on any given drunk driving trip are reportedly of the order of one in 2000 to perhaps as high as one in 200 (Borkenstein, 1975; Beitel et al. 1975). Hence it is highly likely that a person will experience many "successful" drunk driving trips before ever being apprehended. Norstrum (1983) quotes research showing that crime rates were affected by increased risk of detection only after the detection risk had reached a certain threshold value, which was about 30 percent. Below this level, risk of detection did not affect crime rates. All the available evidence indicates that the risk of detection for drunk driving is well below such a threshold

value. Furthermore, the very low rate of apprehension means that, if efforts are focused primarily on those who are detected, they are affecting only a very small part of the total offending population.

The extensive time required on the part of the officer for processing a single drunk driving arrest, as well as the time required subsequently in court, adds to the problem of launching sufficient enforcement to apprehend and prosecute a significant proportion of the offending drivers. Even with greatly increased enforcement, it is unlikely that the probability of apprehension can ever be increased to the point of having a significant deterrent effect. It should be noted, however, that increased enforcement coupled with widespread publicity can create an increased perception of risk, which in turn can lead to a decrease in the amount of drunk driving. However, this effect has been shown to be transitory as the public gradually recognizes the true risk of detection (Ross, 1973).

Increased Certainty of Sanctions. In recent years attention has focused on the fact that frequently arrest has not led to any sanctions whatsoever. In the case of drunk driving arrests, one study found that persons who acquired legal counsel had worse prior driving records, were four times more like to be acquitted, were 22 times more likely to have their charges reduced, and had worse subsequent driving records, when compared to those who did not obtain legal counsel (Blumenthal and Ross, 1973).

Once a person is identified as engaging in violation behavior, there is evidence that there are systematic biases in who is actually convicted. A North Carolina study found that once a crash-related violation had occurred, the probability of conviction was higher for

nonwhites, persons age 55 and older, and persons driving older vehicles, all factors that may be considered rough indicators of socioeconomic status (Waller et al. 1983). As mentioned earlier, the acquisition of legal counsel has been found to be associated with more lenient treatment, and it is probable that socioeconomic status is associated with at least the quality of legal counsel obtained.

In part because of such inequities, there as been a move toward per se laws, in which a measured bac at or above a specified level (usually 0.10 percent) is automatically considered a violation (similar to speed laws where there is no question of wnether the driver was capable of driving safely at the higher speeds). In 1975 North Carolina implemented per se legislation making it a violation to drive with a blood alcohol level of 0.10 percent or higher, but followup studies showed that it had little or no effect (Loeb, 1980).

Another measure implemented to insure that some sanction will occur is administrative revocation of license. At least nineteen states now have statutes that allow the licensing authority to suspend or revoke a person's driver license upon the establishment of probable cause for believing that the person was driving drunk. Ordinarily the suspension/revocation occurs prior to any court procedure and is independent of the outcome of the court proceeding. Reeder (1981) has conducted a process evaluation of Minnesota's administrative revocation statute, and Lowery (1983) reports that the statute resulted in a belief that probability of apprehension and punishment had been increased. However, to date there have been no evaluations of administrative revocation of license as a general deterrent to drinking and driving.

Increased Severity of Sanctions. Recent legislation has also attempted to increase the level of punishment for convicted offenders. Efforts to increase level of sanctions include the elimination of plea bargaining DWI charges to lesser offenses, mandatory penalties for conviction (which may be related to bac level and/or severity of crash), and jail sentences. It could also be argued that the increased legal fees that are accompanying the more stringent laws, as well as the increased insurance premiums that follow any conviction for an alcohol related infraction, should be included in this category.

Increased severity of sanctions is a favorite response to the problem of drunk driving. A frequent reaction on the part of the public is to advocate jail sentences for convicted offenders. Yet this same public, when serving on juries, is reluctant to convict if sanctions are viewed as too harsh. Efforts to make penalties more severe may backfire and conviction rates decrease. When jail sentences became mandatory for first offense drunk drivers in Arizona, innocent pleas almost tripled, requests for jury trials increased by more than 60 percent, and convictions dropped 23 percent. In addition, there was a significant increase in court expense and backlog (McGuire and Peck, 1976). Conversely, a decrease in level of sanctions can lead to an increase in convictions (Johns and Pascarella, 1971).

Education and Rehabilitation. There is always strong support for education as a solution to the problem of drunk driving, although the support is usually much weaker when it comes to funding. Educational efforts in this area may be divided between those that

occur prior to conviction (prevention education) and those that follow conviction (rehabilitative education).

Preconviction education efforts include public information and education (PI and E) efforts, sometimes taking the form of special advertising campaigns. These PI and E efforts may be publicly funded or may be sponsored by the alcohol industry itself (the House of Seagram has a long history of producing and sponsoring advertisements cautioning moderation). More recently, special curricula have been developed for use in the public schools beginning as early as kindergarten level. These curricula usually cover a broad range of topics in traffic safety or on alcohol and other drugs generally. Special units for use in driver education courses focus more specifically on alcohol and driving, but many jurisdictions have either ceased to fund driver education or are seriously considering such a move.

Increased education has not been shown to be effective when the criterion is behavioral change. Although it is not usually difficult to effect changes in knowledge and attitudes, behavior is not easily modified through the traditional approaches to education. There is even some evidence from drug education that the presentation of information is associated with increases in drug use (Robertson, 1981a).

In highway safety, efforts to change behavior through education have not been noted for their success (Robertson, 1975; Robertson, et al., 1974). It has even been argued that the availability of driver education increases rather than decreases motor vehicle deaths among young people (Robertson and Zador, 1978).

Post-conviction educational efforts include alcohol education schools designed for the convicted drunk driver and to which convicted offenders are sent (sentenced may be more accurate). These schools typically consist of anywhere from eight to twelve hours of classroom work, although a few are longer. Ordinarily, successful completion of the course requires only that the person appear as a warm body for the required number of hours.

Evaluations of these schools have generally failed to show evidence that they are beneficial (Nichols et al. 1978; Hagen et al. 1978; Popkin et al. 1983). There is some evidence, however, that educational programs may achieve some modest success with at least some convictees (Reis, 1983). A program sponsored by the U.S. Navy combines its more formal educational efforts with a more comprehensive approach involving the family members, superior officers, and Alcoholics Anonymous and other self-help groups (Bunn, 1983). The opportunities for the control necessary to operate such a program exist in the Navy, but whether the approach could be adapted to civilian life is problematical.

It is also important to recognize that even if all post-convictee educational programs were successful, because they deal with so small a part of the total problem, they cannot be expected to have a major impact on the total amount of drunk driving.

It should be noted that any educational efforts in this area are usually being conducted in an environment that is basically hostile to the message that is being promoted (Wallack, 1981). There are many sources of messages countering the educational communication. This point may be especially salient in relation to young people and

especially the young male. In examining sanctions and social deviance, Tittle (1980) reports that informal sanctions (those imposed by persons closest to one, e.g., disapproval by one's peers) have much greater deterrent effect than formal ones (those imposed by the community or the larger society, e.g., sentences imposed by the court). Zimring and Hawkins report similar findings (1973). The young male subculture frequently does not particularly disapprove of drunk driving aside from the risk of being apprehended. Indeed, drunk driving trips that are successfully completed may even be accomplishments to be shared with peers. However, there is some evidence that legal and social sanctions may be additive (Grasmick and Green, 1980).

Improved EMS Services and Medical Care. The combination of drinking and driving might not be of great concern were it not for the resulting injury and death. Improved emergency medical services (EMS) are one way to reduce the undesirable consequences. Because alcohol is so often associated with spinal cord injury (SCI), efforts to regenerate neural tissue and/or enable SCI victims to regain function through elaborate techniques for electrical stimulation of nerves could also be considered as potential countermeasures. If medical treatment could "cure" the health problems created by drunk driving, there would be less concern.

EMS services focus on the individual after the event has occurred. They represent an attempt to intervene to prevent further damage and to enhance the probability of recovery. Medical care is a continuation of EMS in that it attempts to restore the patient as completely as possible to his premorbid level of functioning.

Increased and improved EMS services have been shown to reduce morbidity and mortality resulting from motor vehicle accidents. Such services have also been shown to result in marked reductions in medical care costs (Zieziulewicz and Tarrants, 1982). However, the research in nerve regeneration, while promising, is still at an experimental level even with animal models (Puchala and Windle, 1977; Kao et al., 1983). Clinical investigation of the feasibility of enervating muscles through electrical stimulation is extremely costly and is still exploratory in nature. In any event, because these services are dealing at the level of the individual after the fact, they cannot be expected to have a major impact on the overall problem of drunk driving.

Summary of Countermeasures Focused on Individuals. The evidence for the effectiveness of the countermeasures discussed thus far suggests that these approaches are not likely to have major lasting preventive impact on the population of concern.

It is also of interest that of the 88 recommendations made by the Presidential Commission on Drunk Driving (1983), 47 could be defined as dealing with enforcement, prosecution, and adjudication, while another 12 deal directly with the convictee. An additional 13 deal with public education and information, for a total of 72, or 82 percent, that are based on the premise that the drunk driving problem is a matter of personal responsibility and choice and should be dealt with primarily by programs targeting the individual.

The emphasis in the Commission's report reflects the values of the society that still emphasize personal fault and individual blame. Although we have accepted the concept of preventive measures regarding

the common communicable childhood diseases, we have been much slower to recognize how the society can similarly intervene to reduce injury-induced morbidity and mortality.

The tendency to focus on the individual responsibility approach and hence opt for some of the least effective (and most expensive) countermeasures has been satirized by Haight in an essay entitled, "A Traffic Safety Fable" (1973). He describes a bridge that, in order to stay within the budget, was built without a railing. Because a substantial number of cars were driving over the side and into the water, with death resulting to many of the occupants, a number of countermeasures were introduced. These included an efficient rescue service using a high powered patrol boat, more rigorous police patrol, extensive educational efforts and publicity campaigns to encourage people to drive more carefully, the postulation of a new type of psychological fixation called "Enchantment with the Deep," and so forth.

Preoccupation with such approaches satisfies the public demand that something be done about the problem, but too often it also diverts attention from other potential countermeasures that may prove far more effective.

Countermeasures Based on a Societal Approach

Although there is not as much evaluative research of the countermeasures based on a societal or systems approach, what evidence there is suggests that they may offer greater promise for lasting effects.

Reduced Alcohol Availability. Ever since the great Prohibition experiment, there has been opposition to efforts to restrict the

availability of alcohol. Nevertheless, there are restrictions in this area, although in some localities it may not appear to be the case. Alcohol availability may be restricted in any of several ways.

First, there are restrictions on where alcohol is sold. In some states it is sold only in state owned and operated outlets, while in others it is readily available in licensed establishments. When restrictions vary by type of beverage, beer and wine are usually less stringently controlled than distilled spirits. There may also be limitations on the type of outlet that may sell alcohol, e.g., there may be restrictions on its availability at convenience stores or service stations.

Restrictions are usually placed on when alcohol is sold. Hours of purchase are usually specified, as are days, e.g., no sale on Sunday before 1:00 pm, no sales on election days.

The quantity of alcohol sold may be restricted in terms of amount sold to any one individual at any one time. There may be requirements placed on the proportion of alcohol sales in relation to food sales in restaurants. Whether alcohol is sold at room temperature or chilled is also regulated in some states.

All states regulate to whom alcohol may be sold, and in no state may it be sold to a minor. Recent age of purchase legislation has been aimed at increasing the age at which a person may legally purchase alcohol. After ratification of the constitutional amendment lowering the age of majority to 18 years, many states lowered the legal drinking age as well. Subsequently, fatal crashes among young drivers increased, and as a result many states have since increased the legal age of purchase to 21 years. Evaluation of the impact of

these changes shows significant reductions in alcohol-related motor vehicle crashes of young drivers with corresponding decreases in injury and death (Wagenaar, 1983). Thus, restricting availability of alcohol through age of purchase legislation is an effective countermeasure against drinking and driving crashes among youth.

Restrictions are also placed on the sale of alcohol to intoxicated persons or habitual drunkards. Recent dram shop laws place responsibility on commercial servers of alcohol to refuse service to anyone who is visibly intoxicated (Mosher, 1979), even though common law has always provided for liability in this area. Mosher (1983a) outlines a strategy for such server intervention that provides for training of servers, legal measures to define responsibility and liability, and environmental design of establishments. Although dram shop laws have existed since the mid 1800s, they have recently received new emphasis. However, there is not yet evidence of their effectiveness in prevention of drunk driving.

Modification of Tax Policies. Tax policies strongly affect the price of alcohol, which in turn has been shown to be related to consumption (Cook, 1981; Levy and Sheflin, 1983). There are at least three areas of tax policy worthy of concern.

First, the area most commonly considered is the direct tax on alcohol sold to the public. Because taxes comprise the greater part of the purchase price of alcohol, major modifications may be expected to modify consumption. There is evidence that increasing the direct taxes on alcohol sold to the public not only reduces consumption but also differentially reduces the consumption of heavy drinkers (Cook

and Tauchen, 1982). However, there may be a point at which increased taxes, and hence increased cost, may encourage the production and sale of "white lightning" or bootleg alcohol.

A second area of tax policy concerns the industry tax deductions for costs of advertising. The alcohol industry spends over a billion dollars a year on advertising, all of which is tax deductible. Industry tax deductions for the costs of advertising are generally considered a legitimate business expense, but it may also be argued that when the advertising is promoting a product that creates so many social problems, there may be a need for greater restraint.

A third area of tax policy relates to the tax deductions claimed by business and industry for purchase of alcohol, e.g., for entertainment. Mosher reports that in 1982 this market accounted for 12 percent of the total retail alcohol market at a cost of more than ten billion dollars (1983b). It may be anticipated that the removal of tax deductions for alcohol purchase would decrease the frequency of the practice.

Increased Regulation of Alcohol Advertising. In addition to the monies spent by the industry on direct advertising, other monies are devoted to "public relations" and fund activities designed to promote good will. The Bureau of Alcohol, Tobacco, and Firearms (BATF) has statutory authority and responsibility for the regulation of alcohol advertising, but as Mosher and Wallack (1981) have so aptly pointed out, they have failed to exercise this authority responsibly even in the face of overwhelming public demand for strong controls.

It should be noted that the industry itself generally observes self-imposed restrictions on where advertisements may be placed

(commercials for distilled spirits generally do not appear on television), as well as on what appears in an advertisement (on television commercials persons are not shown actually consuming beer or wine).

There are no studies on the effectiveness of modifications in alcohol advertising, but the unwillingness of the industry to make significant changes suggests that they would anticipate a corresponding reduction in sales.

The content of alcohol advertising has been examined by Atkin and Block (1981) in a study sponsored by the Bureau of Alcohol, Tobacco, and Firearms; the Federal Trade Commission; the National Institute of Alcohol Abuse and Alcoholism; and the U.S. Department of Transportation. Their study focused largely on persons between the ages of 12 and 22, although it included a smaller sample of adults beyond that age. Briefly, they found that alcohol advertisements appearing on television and in magazines and newspapers communicate messages that associate drinking with being glamourous, handsome, rich, successful, happy, living the "good life." Furthermore, those who appear to be the most affected by the advertising are young people (including early teens) and problem drinkers. Although the authors caution that their methodology does not prove causal relationships between advertising and drinking behavior, their findings must be considered seriously in attempts to identify countermeasures for drinking and driving among youth. Their original report runs to 434 pages and does not appear to be generally available, but it is briefly described and discussed by Breed and DeFoe (1981a). Interestingly, although the U.S. Department of Transportation was a sponsor of the

study, a copy was not included in their library until after an outside inquiry in 1983.

Mosher and Wallack (1979) have proposed reforms in the regulation of alcohol advertising, but any major changes would require a drastic shift in Federal policy.

Modification of Media Program Content in Relation to Alcohol. It may be that the effects of alcohol advertising are secondary to those of the content of programs and stories presented in television, movies, and elsewhere. Research findings suggest that, albeit inadvertently, current television programing may be teaching our youth that it is acceptable to consume large quantities of alcohol (Greenberg, 1981). Breed and DeFoe (1981b) examined the manner in which drinking is portrayed on prime time television and found that more than half of the drinking was potentially problematic. In one quarter of the cases it occurred during or just before work, and by far the most frequent reason for drinking was as a response to a crisis. Driving was frequently shown after drinking, and in most instances the drinker was a "good guy" and experienced no adverse consequences of his drinking behavior. Television programing constitutes a powerful message communicating a level of drinking behavior that is far greater than what is reported in any survey of the general population (Moore and Gerstein, 1981; DeLuca, 1981). The programs are presenting a "norm" that does not exist in the real world at the present time.

Regarding movies, there is a growing practice whereby large sums are paid to have a specific product shown or used conspicuously in a film. The actors are no longer limited to commercials but can now be

seen consuming brand name beers as an integral part of a film.

There are no systematic studies on the effects of modifying media content over an extended period of time, but the available evidence suggests that the content of prime time programs may be communicating messages regarding alcohol that could be harmful to the health and safety of young people. As Wallack (1981b) has pointed out, the media may not tell people what to think, but they do tell them what to think about. Children in our society spend more hours watching television than they spend in school (Singer, 1983), so whatever is being portrayed must be considered a powerful educational influence, for better or worse.

Improved Highway Design. One approach to reducing the morbidity and mortality resulting from drinking and driving by young people is to make the driving task easier so that the impaired driver may still be able to cope with it. The best designed highways, namely, the Federal interstate system, experiences the lowest mileage fatality rate, less than half of that for all roads as a whole (National Safety Council, 1983). The evidence is clear that improved highways are a major contributor to reduced morbidity and mortality. To the extent that the driving task is made easier, the drinking driver will be better able to cope, and to the extent that the highway is made more forgiving (e.g., using crash barriers, breakaway signposts), the drinking driver and his victims will more likely survive.

At a recent conference sponsored by the American Society of Civil Engineers, Hall (1983) addressed the problem of designing highways for the drinking driver. He points to evidence that shows that at certain times and in certain locations 10 percent or more of the drivers are

legally intoxicated (bac 0.10 percent or higher), and 30 percent or more have been drinking. Although it may not be feasible to design a road that could accomodate all drunk drivers, if the states have for all practical purposes defined the legal level for intoxication as 0.10 percent bac, there is the implication (largely supported by adjudication) that drivers with alcohol levels below 0.10 percent are driving legally. Therefore it may be argued that there is a responsibility to include these drivers in establishing a design standard for highways. It should also be recognized that in doing so, the driving task will be made easier for drivers who are inexperienced, fatigued, distracted, preoccupied, or for any other reason not performing at optimum level.

Increased Vehicle Crashworthiness. Another approach to reducing morbidity and mortality from drunk driving is to increase the protection of the vehicle occupant in the event of a crash. Although much has already been accomplished in this area over the last 15 years, there is room for further improvement in occupant protection. First and foremost is a need for legislation requiring the use of available safety belts. New York has just become the first state to enact such legislation. Virtually all passenger cars, as well as many vans and pickup trucks, in use today were equipped with belts at the time of manufacture. Many injuries and deaths resulting from drunk driving would not occur if safety belts were used. Other promising vehicle modifications include effective passive restraint systems, laminated windshields to protect the head and face from lacerations, and other vehicle modifications found to reduce probability and/or consequences of crash.

The Federal Government establishes Federal Motor Vehicle Safety Standards (FMVSS) that must be met by the automotive industry. These standards have led to innumerable improvements in vehicle design which have been shown to be effective in reducing morbidity and mortality in crashes (Kahane, 1979; Chi, 1980; Hume et al., 1981; Robertson, 1981b Reinfurt, 1982; Chi, 1983). As in the case of improving the highway, this type of countermeasure is effective regardless of whether the driver is drunk or is the innocent victim of a culpable driver.

Summary of Countermeasures Focused on Society. Although there has been less of a societal orientation toward solving the problem of drunk driving, there is a growing awareness that the society can make a difference. However, most of the societal effort is still defining the problem as one of personal responsibility, with the greatest focus on enforcement and punishment. Nevertheless, the societal orientation has great promise. Where it has been tried, the results are encouraging, e.g., motor vehicle safety regulations that have led to increased crashworthiness of all vehicles, not simply those driven by "unsafe" drivers. Although the costs have been borne by the larger society, the benefits have been widely shared in that the costs of motor vehicle injuries are borne by everyone. Countermeasures based on a recognition of how the system encourages or discourages drunk driving are likely to be much more effective (and less expensive) than those that rigidly adhere to an insistence that the problem is one of individuals.

SPECIAL FACTORS AFFECTING DRINKING AND DRIVING IN YOUNG PEOPLE

The evidence is clear that young drivers are disproportionately represented in alcohol-related crashes and deaths. Any serious

attempt to reduce drinking and driving among this group must take into account the myriad of factors and influences that affect both the decision to drink and drive and the consequences that ensue. These factors include the relative inexperience in both drinking and driving that characterizes most young people, the market that young people constitute and the efforts to win this market, influence of peers and role models, and the growing evidence of biological variables that may be relevant to the drinking and driving problem.

Driving and Drinking Experience

Young people are less experienced drivers. It takes years to become a "good" driver, and crash rates by the driving population show a steady decrease from age 16 to about age 25. This decrease in crash rate is still apparent when mileage driven is considered (Waller, 1983). Young people are also less experienced drinkers, in terms of knowing how to drink as well as how much to drink. When the two kinds of inexperience are combined in a potentially hazardous environment, the result is that young drinking drivers run a higher risk of crash (Carlson, 1972).

Youth as a Market

Young people have more money to spend than has been true in some previous periods in our history, and the relative cost of alcohol is less (Cook, 1981). Thirty to forty years ago the difference between the cost of a beer and the cost of a soft drink was as much as five-fold. Today it is possible at times to purchase a six-pack of beer for less than a six-pack of cola. Such a change in price differential clearly makes feasible choices that previously did not exist. Furthermore, young people may be more receptive, less set in

their ways, and in the process of formulating brand preferences. There is strong competition to win this market.

Beer is heavily promoted in activities for young people where driving is often essential, e.g., sports events, rock concerts. Since 1973 the major breweries have conducted special promotional efforts aimed at college students. Deroe and Breed (1979) found that in a sample of college newspapers, alcohol advertisements made up approximately half of all national advertising, with most of it for beer. Breweries sponsor major social events for college students in which unlimited supplies of beer are provided free of charge. In North Carolina, because these events may not occur on state campuses, they are held in other locations, thus increasing the necessity for automobile transportation.

Beer is also readily available in places that cater to young audiences, e.g., major sports and entertainment arenas. Frequently these centers have little or no access via public transportation, inevitably increasing the rate of drinking and driving among young people.

Alcohol advertising and alcohol as portrayed in media programing, particularly television, have been discussed earlier, but the combined impact of television advertising and television programing has not been seriously considered in relation to its effects on youth. We spend billions of dollars on our public education system, and hire specially trained experts to develop and teach materials designed to build on what has been previously taught. At every level of government there are official bodies accountable to the public and committed to maintain and enhance the public education system. Yet we

know that our children spend more hours viewing television than they spend in school. Where are the experts responsible for what youngsters are learning from this other powerful source? Where is the public accountability?

In commenting on the potential effects of such messages, Straus writes:

> Societal pressures toward conformity in drinking too much are supported by the frequency with which heavy drinking is depicted as associated with success in fiction and the modern mass media. Over and over again our population is exposed to the image of beautiful women and handsome men consuming what for most people would be too much alcohol and then proceeding to be successful in outwitting their adversaries, driving their cars at high speed in heavy traffic or on mountain roads, catching a criminal, or making magnificent love. (1977, pp 23-24)

Because children spend so much time watching television, there must be greater attention paid to the implicit messages and values that are being communicated through this media.

Misleading messages are also communicated to children and young people regarding the relative potential for intoxication of beer and wine versus distilled spirits. Including beer and wine but not distilled spirits advertising on television, having differential ages of purchase for different kinds of alcoholic beverages, and having differential availability of different types of alcoholic beverages imply that beer does not count or that, at the very least, it is not

so intoxicating as distilled spirits. Yet beer has been reported to be the preferred beverage among DWI drivers (Perrine, Waller, and Harris, 1971).

Influence of Peers and Role Models

Exposure to drinking and driving by peers and role models is an important source of influence. Zimring and Hawkins (1973) found that young people (age 15-20) are much more concerned about the stigmatization by friends and family than they are by any formal punishment. Yet drinking and driving is widespread in our society, and there is no particular stigma attached to it unless one is caught. This fact, in combination with the societal support of the macho beer drinking image for the young male, inevitably places these young people in a conflict situation. They are the recipients of very contradictory messages, and the messages urging that they engage in drinking-driving behavior may be stronger.

Biological Variables Related to Alcohol

Another potential factor in the drinking-driving problems of youth is suggested by the growing evidence that there may be real biological differences in how vulnerable different persons are to alcohol addiction. There is a body of research indicating familial tendencies toward alcoholism, taking into account environmental effects. Studies of human populations have identified biochemical differences that appear to be associated with the effects of alcohol ingestion (Agarwal et al. 1981; Cloninger et al. 1981; Ewing, 1982; and Goodwin, 1979). Consequently, when young people begin experimenting with alcohol, they do so in ignorance of their own susceptibility to addiction.

There is further research, including both animal and human models, that may have some explanatory value for the overinvolvement of young males in drunk driving crashes. Research based on animal models shows that alcohol interacts with testosterone to affect the degree of aggressive behavior exhibited, and that in some situations it greatly increases the amount of such behavior (Miczek and Barry, 1977; Winslow and Miczek, 1984; DeBold and Miczek, 1984).

Personality research may also be relevant to the drinking behavior of young people. The Minnesota Multiphasic Personality Inventory (MMPI) is surely the most thoroughly investigated objective personality test in existence. It has long been established that elevated scores on the Psychopathic Deviate (Pd) scale and the Hypomania (Ma) scale are related to delinquent and acting out behavior (Goodstein, in Welsh and Dahlstrom, 1956). However, it is also well established that it is "normal" for young people to show elevations on these scales (Hathaway and Monachesi, 1963), although most show lower scores as they grow older. Thus, at least as indicated by MMPI scores, young people as a group appear to be more predisposed toward acting out behavior.

Other studies, using male human subjects, have shown that perceived alcohol ingestion can cause greater increases in aggressive behavior than actual alcohol ingestion at low doses (Lang et al, 19?5; Wilson and Lawson, 1976). However, more recent work by George and Marlatt (1982) found that, in an anger-provoking situation, alcohol intake at low doses interacts with the perception of alcohol ingestion to differentially affect the responses of young males to slides depicting violent situations.

The role of alcohol in aggressive and other acting out behavior is far from clear, but the findings from these studies are consistent with what has long been observed clinically. At the same time, they raise serious questions about the influences our society creates for the young male in particular.

Summary of Factors Affecting Drinking and Driving in Young People. Most young people in our society are inexperienced in both drinking and driving. If they choose to engage in both of these behaviors, and the evidence is clear that the majority of our population so chooses, then there is a need for opportunity to acquire each of the skills within a relatively safe environment, that is, in isolation from each other. Yet the current social climate appears to encourage exactly the opposite. While the young person is still a relatively unskilled driver, he is subjected to a variety of pressures to drink in combination with driving. Although the research evidence on biological variables that may interact with alcohol is still tentative, there is some suggestion that young males in particular may be especially vulnerable to acting out behavior after alcohol use.

DRUNK DRIVING AS A MAJOR PUBLIC HEALTH PROBLEM

Drunk driving, and especially drunk driving among young people, is a major public health problem in the U.S. today. This problem is quite separate from that of alcoholism. Indeed, most young people who drink and drive are not alcoholics, and most of them will not become alcoholics. The major reason their drinking/driving behavior is of public concern is that it leads to injury and death on a scale that affects the entire society.

It is a basic principle of public health that we deal with

preventive measures rather than focus most of our efforts on treatment after the fact, i.e., we focus on the total system in an attempt to intervene before the problem materializes (Barry, 1975). When we focus primarily on the arrest and conviction of drunk drivers and the treatment and rehabilitation of the injured, we are unlikely to achieve lasting effects of any magnitude.

The classic epidemiological study of cholera in 19th century London illustrates the differential effects of focusing on individuals as opposed to getting at the source of the problem (Rosenberg, 1962). When it was observed that people drinking from one well were much more likely to contract the disease than those who obtained water from a second well, steps were taken to close the contaminated well. Such an approach is, first, much more effective in combatting the problem, and second, much less expensive than trying to persuade everyone to boil water before drinking it. Simply telling everyone to use the water from one source but not the other, without taking steps to remove the source of contamination, is much less effective.

In one sense the social climate in which our young people are reared may be considered to be contaminated with messages and influences that are encouraging them to engage in drinking and driving behavior. We can admonish them not to do so, and we can arrest and punish those who transgress and are apprehended. But we can also take steps to alter some of the sources of the contamination. While the problem is not quite so simple as a contaminated well, the analogy still holds, and the public health experience suggests that measures aimed at modifying some of the causal influences are more likely to be effective and at lower cost.

A judge from Oregon has expressed some of his misgivings in dealing with young drunk driving offenders. In Oregon alcohol is sold by the State, and, as he says, "You could consider the State a major drug pusher that depends on sales for income. Then when someone slips up and uses too much, the same State condemns him and invokes sanctions."

Enforcement, prosecution, and sanctions are necessary components of any comprehensive effort to reduce the morbidity and mortality from motor vehicle injuries among young people. But it is at least as important to examine the policies and conditions that are not simply allowing drunk driving but actively and energetically encouraging and guaranteeing its occurrence.

There is no lack of individuals, organizations, and vested interest groups that vigorously support the current climate of focusing on punishment of the convicted offender and perhaps support for the victim. A major brewery provided much needed funding for M.A.D.D. (Mothers Against Drunk Drivers) and relocated their headquarters. Although the money was necessary for effective continuation of the organization, breweries have a special interest in strengthening the current individual offender/victim approach to the problem. The possibility remains that M.A.D.D. will exercise its option to pursue alternative approaches that promise effective management of drinking drivers. Their support of a national minimum drinking age of 21 is a step in this direction.

Those with vested interests in maintaining the status quo will almost certainly oppose most measures that focus on major system modifications. Their arguments are likely to speak of patriotism,

capitalism, free enterprise, first amendment rights, and the right of the individual to decide. It should also be noted that the system modifications they oppose most strenuously are usually those that may adversely affect their profits. Drunk driving, however, threatens the safety of others on the road and creates economic and psychological burdens that are borne by the entire society. Therefore, it may no longer be appropriate to deal with it primarily as a problem of individuals.

Straus describes how environmental factors may operate in an individual's decision whether to drink:

> ...available evidence should lead us to look further at the probability that a very significant number of people who drink too much are drinking what is for them excessively in response to cues, or to clusters of cues, in which these social pressures that stem from outside the individual have a very high priority. I think also that in the life histories of many people who drink too much we are going to find that, in the early stages particularly, social cues for many people have a much higher priority. They may reach a stage where they are giving higher priority to the meaningfulness of alcohol in terms of inner stress or tension reduction. But actually, social pressures themselves cause a large amount of the stress and tension associated with individuals drinking beyond their comfortable capacity. These individuals may then drink to alleviate the anxiety they would feel if they were not to drink, because they wouldn't be one of the crowd, because they wouldn't be accepted, because they would be

> impolite, because they wouldn't be fulfilling amenities, or because they wouldn't be satisfactorily performing expected behavior in connection with their role as a diplomat, or as a salesman, or as a miltary officer who has to demonstrate that he can drink like a Marine. (1977, pp. 30-31)

Or, we might add, as a young male who would not be living up to the expectations our society has been communicating to him throughout his lifetime.

CONCLUSION

The morbidity and mortality caused by drinking and driving among young people clearly constitutes a major public health problem in the U.S. today. Although there has been growing recognition of the magnitude of the problem, there has not been a corresponding appreciation of how traditional public health strategies may be applicable. Countermeasures that are most popular, with legislators and the public alike, are based on a perception of the problem as primarily one of personal responsibility. Yet youthful drinking and driving is more than an individual problem. It is the consequence of a variety of factors that must be addressed before we can have a lasting impact on the problem.

Our society creates conditions that have lethal consequences for our young people, especially our young males. A response to the problem that focuses primarily on the individual and deals with him as a criminal is unfair not only to him but also to the larger society because it does not represent the most effective allocation of limited resources.

Drinking and driving among young people is indeed a cause of

injury and death, but it is also the predictable and inevitable effect of the social climate in which we rear our young people. Until we recognize and deal with some of the sources of the drinking-driving problems of youth, drunk driving will continue to be a major cause of morbidity and mortality for this age group.

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